

Web-based Education & Training for Illicit Trafficking and Consequence Management associated with Nuclear and Radiological Terrorism

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Keywords: Nucleonica, web applications, illicit trafficking, consequence management

ABSTRACT

The JRC's NUCLEONICA nuclear science portal (www.nucleonica.net) is currently being extended to include a variety of tools specifically for education and training purposes in illicit trafficking and consequence management associated with nuclear and radiological terrorism. In the following paper we describe the web applications currently under development.

With the source term and *radiological event scenario analysis* module, the consequences of a radiological dispersion event (RDE) can be estimated. Two separate modelling stages are accounted for: (i) dispersion of radioactive aerosol under given meteorological conditions, (ii) public health consequences due to exposure to the radioactive aerosol. In order to describe the evolution of a radioactive aerosol plume resulting from an RDE, the wedge model [1] is used. This gives a simple, intuitive account of the dynamics governing the dispersal of a radioactive aerosol cloud under given meteorological conditions.

Nowadays γ -spectrometry is in daily use by radiation protection staff, border police, customs and law-enforcement officers to identify and quantify γ -emitting nuclides in different objects encountered in illicit trafficking and consequence management incidents. To address these growing demands in education & training, an interactive web-accessible simulation tool, the *Gamma Spectrum Generator*, has been developed within NUCLEONICA. With the generator [2], the user can model γ -spectra for arbitrary mixtures of known γ -emitting nuclides and user-specific detection system based on a HPGe or NaI crystal. The generator presents an efficient visual teaching aid that is especially useful in training facilities which have restrictions on the use of radioactive substances, or when sources of special interest (e.g. spent fuel, enriched U, weapon grade Pu or other highly radiotoxic materials) are not readily available.

Fast and accurate dosimetry and shielding calculations for gammas and neutrons are possible with NUCLEONICA's powerful on-line *easyMonteCarlo* web-service and associated web-based application. The easy-to-use intuitive interface allows the user to define any complex radiation object. Possible radiation sources include mixtures of gamma-emitting or spontaneous fission nuclides. The virtual point detectors can be placed in arbitrary locations around the object to evaluate particle fluxes and dose rates. Together with relatively simple dosimetry and shielding calculations, *easyMonteCarlo* can be applied for advanced studies, for instance, investigating the effects of self-attenuation in the source, the dose and flux build-up effects in the source and shield etc. All these features make the *easyMonteCarlo* web-service useful for both training purposes and real case studies associated with illicit trafficking and consequence management activities.

References:

1. J. Magill et al., Consequences of a Radiological Dispersion Event with Nuclear and Radioactive Sources, *Science and Global Security* 15:107-132, 2007.
2. A. N. Berlizov and J. Magill, An Interactive Web Accessible Gamma Spectrum Simulator, *Transactions NESTet Nuclear Engineering Science and Technology*, Budapest, Hungary 4-8 May 2008, see <http://www.euronuclear.org/events/nestet/transactions.php> (Nucleonica web portal).